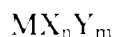


What is claimed is:

1. A catalyst for producing aliphatic polycarbonate, comprising a rare-earth coordination compound with the formula:



wherein, M is a rare earth element selected from the group consisting of Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tu, Yb, Lu, and a mixture of two or more of the rare earth element; X is a carboxylic acid group or sulfonic acid group with Ka values above  $10^{-3}$ ; Y is selected from the group consisting of -Cl, -NO<sub>2</sub>, =O, -OH; n and m is dependently an integer from 0 to 3;

an alkyl metal compound, wherein the metal is zinc, magnesium or aluminum, and the alkyl group is selected from the group consisting of CH<sub>3</sub>-, CH<sub>3</sub>CH<sub>2</sub>-, CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>-, (CH<sub>2</sub>)<sub>2</sub>CH-, CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>-, (CH<sub>2</sub>)<sub>2</sub>CHCH<sub>2</sub>-, and CH<sub>3</sub>CH(CH<sub>3</sub>)CH<sub>2</sub>-;

a polyol selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol, 1,2-propanediol, 1,3-propanediol, glycerin and a mixture thereof; and

a carbonate selected from the group consisting of ethylene carbonate, propylene carbonate, cyclohexylene carbonate and a mixture thereof.

2. The catalyst of claim 1, wherein the carboxylic acid group or sulfonic acid group is selected from the group consisting of trifluoroacetic group, trichloroacetic group, dichloroacetic group, chloroacetic group, o-chlorobenzoic group, α-tartaric acid group, benzene sulfonic acid group, naphthalene sulfonic acid group and a mixture of one or more of them.

3. The catalyst of claim 1, wherein the rare earth metal element is yttrium or neodymium.

4. The catalyst of claim 1, wherein the carboxylic acid group of the rare earth coordination compound is trifluoroacetic group, trichloroacetic group or dichloroacetic group.

5. The catalyst of claim 1, wherein Y is -Cl or -OH.

6. The catalyst of claim 1, wherein the metal alkyl metal is zinc, and alkyl group is  $\text{CH}_3\text{CH}_2-$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2-$ ,  $(\text{CH}_2)_2\text{CH}-$ , or  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2-$ .

7. The catalyst of claim 1, wherein the polyol is 1,2-propylene glycol, or glycerin.

8. The catalyst of claim 1, wherein said carbonate is propylene carbonate.

9. A method for preparing the catalyst of claim 1, comprising the steps of:

(a) sequentially adding

a polyol selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol, 1,2-propandiol, 1,3-propandiol, glycerin and a mixture thereof;

a rare-earth coordination compound of the formula  $\text{MX}_n\text{Y}_m$ , wherein, M is a rare earth element selected from the group consisting of Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tu, Yb, Lu, and a mixture of two or more of the rare earth element; X is a carboxylic acid group or sulfonic acid group with  $K_a$  values above  $10^{-3}$ ; Y is selected from the group consisting of -Cl,  $-\text{NO}_2$ , =O, -OH; n and m are independently integers from 0 to 3;

and an alkyl metal compound, wherein the metal is zinc, magnesium or aluminum, and the alkyl group is selected from the group consisting of  $\text{CH}_3-$ ,  $\text{CH}_3\text{CH}_2-$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2-$ ,  $(\text{CH}_2)_2\text{CH}-$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2-$ ,  $(\text{CH}_2)_2\text{CHCH}_2-$ , and  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2-$ ;

to the carbonate selected from the group consisting of ethylene carbonate, propylene carbonate, cyclohexylene carbonate and a mixture thereof;

(b) stirring or grinding the mixture thus obtained;

(c) aging the mixture for 1-24 hours under 0-50 times atmospheric pressure of nitrogen, argon, carbon dioxide or under supercritical condition.

10. The method of claim 9, wherein the carboxylic acid group or sulfonic acid group of step (a) is selected from the group consisting of trifluoroacetic group, trichloroacetic group, dichloroacetic group, chloroacetic group, o-chlorobenzoic group,  $\alpha$ -tartaric acid group, benzene sulfonic acid group, naphthalene sulfonic acid group and a mixture of one or more of them.

11. The method of claim 9, wherein the mixture in step (c) is aged under the CO<sub>2</sub> atmosphere.

12. A method for preparing aliphatic polycarbonate by using the catalyst of claim 1, comprising the steps of:

adding the catalyst of claim 1 and an epoxide into an autoclave;

filling the autoclave with carbon dioxide and maintaining the pressure between 10-40 atmospheres;

allowing copolymerization reaction to proceed at 60-100°C for 5-24 hours;

adding a HCl/methanol solution, preferably 50% by weight, or an aqueous HCl solution, preferably 5% by weight to terminate the reaction, thus obtaining a polycarbonate.

13. The method of claim 12, wherein the process is carried out in the absence of solvent.